OPERATION & MAINTENANCE HANDBOOK

CALIBRATION

MODEL 218

DATA/PULSE GENERATOR

Part Number 37001-257

SYSTRON-DONNER CORPORATION

DATAPULSE

10150 W. Jefferson Blvd., Culver City, Calif. 90230

Telephone: 213-836-6100; TWX: 910-340-6766

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MP MASTER

MA28882

OPERATION & MAINTENANCE

HANDBOOK

CALIBRATION

MODEL 218

DATA/PULSE GENERATOR

Part Number 37001-257

1-213-555-1212

Concord
1-415-555-1212
415-682-6161
415-798 9900

DATAPULSE DIVISION
SYSTRON DONNER CORPORATION

10150 W. JEFFERSON BLVD., CULVER CITY, CALIFORNIA 90230

FIRST EDITION

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R36-610

DATAPULSE DIVISION
SYSTRON DONNER

Advance Specifications

MODEL 218 DATA/PULSE GENERATOR

* *operates as a data and a pulse generator*
* *clock rates from 10 Hz to 50 MHz*
* *16-bit, easily expandable word lengths*
* *NRZ, RZ data or pulse format*
* *continuous, sync/async command or manual recycle modes*
* *variable upper and lower voltage levels*
* *remote programming option*

The Model 218 uniquely combines the capabilities of a high-speed pulse generator and the versatility of a 16-bit data generator to offer a low cost ($925.00) instrument of unlimited capability. Operated as a data generator, the Model 218 produces 16-bit words in either NRZ or RZ format with data content controlled by front panel pushbuttons. A remote programming option is available. Words may be recycled continuously, manually or by external command, either synchronously or asynchronously. Two or more Model 218's may be operated in parallel for multi-channel outputs or in series for longer word lengths. Operated as a pulse generator (or in the RZ data mode), pulse width is continuously variable from 10 ns to 100 ms in 7 ranges.

SPECIFICATIONS

REPETITION RATE—Continuously variable from 10 Hz to 50 MHz in 7 ranges.

SYNC GATE—In the pulse format or the continuous recycle mode the instrument can be sync gated by a +2 V signal. The first clock pulse occurs approximately 20 ns after the gate signal. (This provides the capability of varying the word lengths).

EXTERNAL TRIGGER—The instrument may be triggered by an external source with +2 V peak amplitude signal at rep rates from 0 to 50 MHz.

MANUAL TRIGGER—Data cycle (16-bit word) advances one bit each time the manual pushbutton is depressed.

DATA CYCLE—Fixed at 16 bits. Data content pushbuttons determine the state (true or false) of each bit. Two or more instruments may be operated in parallel to form a multiple channel system, or in series to form longer word lengths without pattern limitations.

RECYCLE MODES

Continuous—Serial words repeated sequentially without interruption.

Async Command—A 16-bit word is generated for each command signal (+2 V pulse). The clock is not synchronized with the recycle command.

Sync Command—A 16-bit word is generated for each command signal (+2 V pulse). The clock is synchronized with the recycle command. The clock sync output is a burst of pulses after each recycle command.

Manual—A 16-bit word is generated each time the manual pushbutton is depressed.

DATA FORMAT—NRZ, RZ or PULSE, selectable by a front panel switch.

NRZ—Each data bit remains in the same state (true or false) for the entire clock period.

RZ—The portion of the clock period in which a bit remains in the true state is determined by the width controls. Maximum RZ width duty cycle is 70% of clock period at rep rates from 10 Hz to 10 MHz, decreasing to 50% of clock period from 10 MHz to 50 MHz.

Pulse—In the pulse mode, the instrument functions as a pulse generator. Pulse width is variable by means of the width controls. The digital portion of the instrument is disabled in this mode.

PULSE WIDTH—In the pulse or RZ data mode, the width is continuously variable from 13 ns to 100 ms in 7 ranges. Maximum duty cycle is 70% of clock period at rep rates from 0 to 10 MHz, decreasing to 50% at rep rates from 10 to 50 MHz.

BIT 16 SELECTABLE RZ OR NRZ—In the recycle command modes and for NRZ format, bit 16 may be selected to be either true NRZ (remain true or false until bit 1 of the next recycle occurs) or may be returned to zero one clock period after bit 16 begins.

DATA OUTPUTS — Simultaneous positive true and complement outputs are provided from 50 ohm sources. Rise/fall times are approximately 5 ns when terminated with 50 ohms.

OUTPUT LEVELS (into 50 ohms)—Upper level is continuously variable from -4 V to +5 V (-8 V to +10 V open circuit). Lower level is continuously variable from -5 V to +4 V (-10 V to +8 V open circuit). Maximum difference between levels is 5 V (10 V open circuit).

SYNC OUTPUTS

Clock Sync—Occurs at the data rate.

Bit 1 Sync—Occurs approximately 20 ns before the first bit in each data cycle (16-bit word).

Bit 16 Sync — Occurs approximately 40 ns before the last bit in each data cycle (16-bit word).

OUTPUT PROTECTION—Short circuits to ground, voltages up to ±10 V or any combination of control settings will not damage the output.

OPERATING TEMPERATURE—0° to 50° C.

POWER REQUIRED — Approximately 50 W, 50–400 Hz at 105–125/210–250 V ac, selectable by means of a multitap transformer and a range switch located on the back panel.

DATAPULSE DIVISION, SYSTRON-DONNER CORPORATION
10150 W. JEFFERSON BLVD., CULVER CITY, CALIFORNIA 90230 · Phone: (213) 871-0410 · TWX: 910-340-6766

PHYSICAL CHARACTERISTICS—Front panel is brushed aluminum finish with black markings. Input and output connectors are BNC type.

DIMENSIONS—16¾" W x 3½" H x 14-5/8" D.

SHIPPING WEIGHT—Approximately 17 pounds. The instrument may be rack mounted by installing a Type 1010 Rack Mounting Set.

ACCESSORIES FURNISHED – One 8-foot, 3-prong conductor power cord and one maintenance handbook.

ACCESSORIES AVAILABLE – Type 1010 Rack Mounting Set, 2003A Power Termination, 2101 Inverting Transformer (for sync outputs only), 2302 Pulse Mixer, 2401 Rise Time Integrator and extra handbooks.

REMOTE PROGRAMMING OPTION—Logic Levels—Zero volts inhibits, +2 V enables.

Programming Time— < 50 ns per bit.

Programming Lines—16 lines (one for each bit) and one line for ground return.

Programming Connector – Winchester 18 pin female, Type XMRE rear mount.

ACCESSORIES FURNISHED – Mating program connector.

DOMESTIC LIST PRICE – $925.00 f.o.b. Culver City. Remote Programming Option: $150.00

DATA SUBJECT TO CHANGE WITHOUT NOTICE

10M 8/71

IMPORTANT! SEE ADDENDA FOR CHANGES TO THIS SECTION.

SECTION II

CONTROLS AND CONNECTORS

2.1 POWER Switch

Applies ac voltage to the transformer primary and illuminates the power lamp.

2.2 CLOCK RATE Controls

The pushbuttons select either MANUAL, EXT or one of seven available ranges and the vernier provides continuous control within the range selected. When the EXT pushbutton is depressed, the instrument can be triggered by an external source at repetition rates from 0 to 50 MHz. When the MAN pushbutton is depressed, manual triggering is selected and each time it is depressed thereafter the data output advances one (1) bit period.

2.3 WIDTH Controls

The pushbuttons select one of seven (7) available ranges and the vernier provides continuous control of the pulse width within the range selected when the instrument is in the RZ or PULSE FORMAT.

2.4 DATA CONTENT Pushbuttons

Determines the state of each bit in the data output. The bit is true when the pushbutton is depressed and false when the pushbutton is released.

2.5 FORMAT Pushbuttons

Select output format to be either NRZ, RZ or PULSE.

2.5.1 NRZ

When NRZ pushbutton is depressed each true bit in the data output remains true for the entire bit period.

2.5.2 RZ

When the RZ pushbutton is depressed, each true bit in the data output remains true for the period of time determined by the WIDTH controls.

2.5.3 PULSE

When the PULSE pushbutton is depressed the instrument functions as a pulse generator.

2.6 RECYCLE Pushbuttons

2.6.1 CONT

In this mode 16-bit words are repeated sequentially without interruption.

2.6.2 COMMAND

2.6.2.1 SYNC

In the SYNC COMMAND mode, a 16-bit word is generated for each command signal (+2 V pulse) at the RECYCLE input. The clock is synchronized with the recycle command signal resulting in synchronous data.

2.6.2.2 ASYNC

In the ASYNC COMMAND mode, a 16-bit word is generated for each command signal (+2 V

pulse) at the RECYCLE input. The clock is not synchronized with the recycle command signal, resulting in asynchronous data.

2.6.2.3 MAN

A 16-bit word is generated each time the MAN RECYCLE COMMAND pushbutton is depressed.

2.7 SYNC GATE Switch

In the ON position, the output can be gated by a signal (+2 V pulse) at the SYNC GATE input when the instrument is in the pulse format or the continuous recycle mode.

2.8 BIT 16 Switch

In the recycle command modes and for NRZ format, Bit 16 may be selected to be either NRZ or RZ.

2.8.1 NRZ Position

Bit 16 remains true or false until Bit 1 of the next recycle occurs.

2.8.2 RZ Position

Bit 16 returns to zero one clock period after Bit 16 begins.

2.9 OUTPUT LEVELS Controls

The maximum difference between the upper and lower levels of the data output is limited to 5 V when the output is terminated with 50 ohms (10 V open circuit).

2.9.1 UPPER LEVEL

Provides continuous control of the data output upper level from approximately -4 V to +5 V into 50 ohms (-8 V to +10 V open circuit).

2.9.2 LOWER LEVEL

Provides continuous control of the data output lower level from approximately -5 V to +4 V into 50 ohms (-10 V to +8 V open circuit).

2.10 EXTERNAL INPUTS

2.10.1 CLOCK

Input connector for an external clock source. A 0 to +2 V pulse is required for trigger.

2.10.2 SYNC GATE

Input connector for a sync gate signal. A +2 V pulse is required for gating. The output occurs only during the time that the signal is applied.

2.10.3 RECYCLE

Input connector for a recycle command signal. A +2 V signal is required for recycling. A 16-bit word is generated for each recycle command signal.

2.11 SYNC OUTPUTS

2.11.1 CLOCK

Output connector for the clock sync. This sync output occurs at the data rate.

2.11.2 BIT 1

Output connector for Bit 1 sync. This sync output occurs approximately 20 ns before the first bit in each data cycle (16-bit word).

2.11.3 BIT 16

Output connector for Bit 16 sync. This sync output occurs approximately 20 ns before the last bit in each data cycle (16-bit word).

2.12 OUTPUT

2.12.1 TRUE

Output connector for positive true data. The amplitude and baseline are variable by means of the UPPER and LOWER level controls.

2.12.2 COMPLEMENT

Output connector for data that is the complement of the data at the TRUE output.

2.13 115/230 V Selector (Back Panel)

Selects the transformer primary configuration for either 115 or 230 V ac.

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IMPORTANT! SEE ADDENDA FOR CHANGES TO THIS SECTION.

SECTION III

OPERATION

3.1 FUNCTIONAL VERIFICATION

The following procedure provides a brief operational check of the instrument and an introduction to its controls.

3.1.1 Equipment (or equivalent) Required

a. A pulse source capable of 50 MHz repetition rate and >+2 V amplitude. Datapulse Model 110B Pulse Generator recommended.

b. A dual-trace real-time oscilloscope with a 50 MHz bandwidth. Tektronix 546 with a Type 1A2 plug-in recommended.

c. Two 50 ohm, 2 watt terminations. Datapulse Type 2010 recommended.

d. Four 50 ohm coaxial cables (2-3 feet long) terminated with BNC connectors.

3.1.2 Data Output Verification

a. Set the instrument controls as follows:

Control	Setting
CLOCK RATE	10 kHz
CLOCK RATE vernier	fully clockwise
WIDTH	100μs
WIDTH vernier	mid-range
DATA CONTENT	odd numbers depressed
FORMAT	NRZ depressed
RECYCLE	CONT depressed
UPPER LEVEL	+5
LOWER LEVEL	0
SYNC GATE	off
BIT 16	RZ

b. Monitor the TRUE and COMPLEMENT OUTPUTS on the dual-trace real-time oscilloscope. Trigger the oscilloscope from the BIT 1 SYNC OUTPUT. Terminate all three outputs with the 50 ohm, 2 watt terminations.

c. Set the oscilloscope controls to display one data cycle (16-bit word).

d. Verify that the odd numbered bits are true (+5 V logic level) for the entire bit period (approximately 100μs) and the even numbered bits are false (0 V logic level) at the TRUE OUTPUT. Verify that the bits at the COMPLEMENT OUTPUT are the inverse of the bits at the TRUE OUTPUT.

e. Release the odd numbered DATA CONTENT pushbuttons and depress the even numbered pushbuttons. Verify that the even numbered bits are true (+5 V logic level) and the odd numbered bits are false (0 V logic level) at the TRUE OUTPUT. Verify that the bits at the COMPLEMENT OUTPUT are the inverse of the bits at the TRUE

OUTPUT. Verify that bit 16 returns to the lower logic level one bit period after it begins.

f. Using the OUTPUT LEVEL controls verify that the upper logic level of the data can be varied from approximately -4 V to +5 V and the lower logic level can be varied from approximately -5 V to +4 V.

NOTE: Maximum difference between the upper and lower logic levels should be slightly greater than 5 volts.

g. Set the UPPER LEVEL control to +5 V and the LOWER LEVEL control to 0 V.

h. Depress the 50 MHz CLOCK RATE pushbutton and set the CLOCK RATE vernier fully clockwise. Verify that clock rate is greater than 50 MHz. Set the CLOCK RATE vernier fully counterclockwise and verify that the clock rate is less than 10 MHz.

i. Check the remaining CLOCK RATE ranges and verify overlap at the upper and lower limits.

j. Depress the 10 kHz CLOCK RATE pushbutton and set the CLOCK RATE vernier fully clockwise.

k. Depress the RZ (FORMAT) pushbutton and verify that the bits are true (+5 V logic level) for approximately 50% of the bit period.

l. Rotate the WIDTH vernier counterclockwise and verify that the bit width decreases. Rotate the WIDTH vernier clockwise and verify that the bit width increases. Set the WIDTH vernier counterclockwise.

m. Sync scope on CLOCK SYNC output. Depress the PULSE (FORMAT) pushbutton and verify that the output changes from a data to a pulse format (pulse occurs approximately every 100μs).

n. Depress the NRZ (FORMAT) and the SYNC (RECYCLE COMMAND) pushbutton. Connect the external pulse generator to the RECYCLE INPUT. Set the external pulse generator for 100 Hz repetition rate, 20 ns width and +2 V amplitude (0 V baseline). Trigger the oscilloscope from the sync output of the external generator.

o. Verify that a 16-bit word is generated approximately every 10 ms. Verify that the 16th bit returns to zero 1 bit period after it begins. Set the BIT 16 switch to NRZ and verify that bit 16 remains true until the beginning of the first bit of the next data cycle.

p. Depress the ASYNC (RECYCLE COMMAND) pushbutton and verify that 16-bit words are generated at approximately a 10 ms rate.

NOTE: Only the first cycle of data output will be stable since the clock is not synchronized to the recycle input signal.

q. Disconnect the external pulse generator from the RECYCLE INPUT. Depress the MAN (RECYCLE COMMAND) pushbutton and verify that a 16-bit word is generated each time the pushbutton is depressed.

3.1.3 Sync Gate Verification

a. Set the instrument controls the same as in paragraph 3.1.2, step (a).

b. Connect the external pulse generator to the SYNC GATE INPUT. Set the pulse generator for 1 kHz repetition rate, +2 V amplitude (0 V baseline) and 500μs pulse width.

c. Monitor the TRUE OUTPUT with the real-time oscilloscope. Trigger the oscilloscope from the sync output of the external pulse generator.

d. Set the SYNC GATE switch to ON.

e. Depress the PULSE (FORMAT) pushbutton and verify that the pulse output is gated.

3.1.4 Sync Output Verification

a. Set the instrument controls the same as in paragraph 3.1.2, step (a).

b. Monitor the TRUE and BIT 1 SYNC OUTPUTS on the dual-trace oscilloscope. Trigger the oscilloscope from the BIT 16 SYNC OUTPUT. Terminate all three outputs with the 50 ohm, 2 watt terminations at the oscilloscope.

c. Verify that BIT 1 SYNC OUTPUT has an amplitude of >+2 V and occurs approximately 30 ns before the first bit of the data output.

d. Disconnect the BIT 1 SYNC OUTPUT from the oscilloscope and monitor the BIT 16 SYNC OUTPUT. Verify that the BIT 16 SYNC OUTPUT has an amplitude of >+2 V and occurs approximately 30 ns before the sixteenth bit of the data output.

e. Disconnect the BIT 16 SYNC OUTPUT and monitor the CLOCK SYNC OUTPUT. Verify that the CLOCK SYNC OUTPUT has an amplitude of >+2 V and occurs at the data rate.

3.1.5 External and Manual Trigger Verification

a. Connect the external pulse generator to the CLOCK input. Set the pulse generator for a repetition rate of 10 kHz, an amplitude of +2 V (0 V baseline) and 20 ns width.

b. Monitor the TRUE OUTPUT on the real-time oscilloscope. Trigger the oscilloscope from the sync output of the external pulse generator. Terminate both outputs with the 50 ohm, 2 watt terminations.

c. Set the instrument controls the same as in paragraph 3.1.2, step (a) except depress the EXT (CLOCK RATE) pushbutton.

d. Verify that the instrument is triggered (data output occurs with a format corresponding to the position of the DATA CONTENT pushbuttons).

e. Verify that the instrument can be triggered from 10 Hz to 50 MHz.

f. Disconnect the external pulse generator. Trigger the oscilloscope from the BIT 1 SYNC OUTPUT.

g. Depress the MAN (CLOCK RATE) pushbutton several times and verify that the dc level of the TRUE OUTPUT changes in accordance with the setting of the DATA CONTENT pushbuttons.

IMPORTANT! SEE ADDENDA FOR CHANGES TO THIS SECTION.

SECTION IV

CALIBRATION

4.1 EQUIPMENT (or equivalent) REQUIRED

a. A real-time oscilloscope with a bandwidth of 50 MHz. Tektronix Type 546 with a 1A2 plug-in recommended.

b. A sampling oscilloscope with a 0.35 ns rise time. Tektronix Type 546 with a 1S1 plug-in recommended.

c. An electronic counter with a 50 MHz capability. Systron-Donner Model 1013 recommended.

d. A pulse source capable of 50 MHz repetition rate and >+2 V amplitude. Datapulse Model 110B recommended.

e. A digital voltmeter capable of reading millivolts. Systron-Donner Model 7015 recommended.

f. Two 50 ohm, 2 watt coaxial terminations. Datapulse Type 2010 recommended.

g. Two 10X, 2 watt, 50 ohm attenuators. Datapulse Type 2015 recommended.

h. Several 50 ohm coaxial cables terminated with BNC connectors.

4.2 POWER SUPPLY CALIBRATION

a. Connect the instrument to the 115 V supply and set the POWER switch to ON. Depress the EXT (CLOCK RATE) pushbutton.

b. Monitor the +15 V buss with the digital voltmeter and adjust R529 for +15.00 volts.

c. Monitor the -15 V buss with the digital voltmeter and verify a reading of -15.00 ±0.3 V.

d. Monitor the +5 V buss with the digital voltmeter and verify a reading of +5.00 ±0.1 V.

4.3 CLOCK RATE CALIBRATION

a. Set the instrument controls as follows:

Control	Setting
CLOCK RATE	50 MHz
CLOCK RATE vernier	fully counter-clockwise
FORMAT	PULSE
WIDTH	100 ns
WIDTH vernier	fully counter-clockwise
UPPER LEVEL	+5 V
LOWER LEVEL	0 V

b. Monitor the TRUE OUTPUT on the counter. Terminate the output with the 50 ohm, 2 watt termination at the counter input.

c. Adjust C31 for a counter indication of approximately 9.5 MHz.

d. Set the CLOCK RATE vernier fully clockwise and verify that the clock rate is >50 MHz.

e. Check the remaining clock rate ranges for overlap at the upper and lower limits.

NOTE: Check the appropriate timing capacitors (C21 through C26) if it is not possible to get overlap on all ranges.

4.4 CLOCK WIDTH CALIBRATION

a. Set the instrument controls the same as in paragraph 4.3, step (a) except select the 10 MHz clock rate range.

b. Monitor TP1K with the sampling oscilloscope. Trigger the oscilloscope from the CLOCK SYNC OUTPUT. Adjust C82 for a clock pulse width of 8 ns.

4.5 BIT 16 RZ CALIBRATION

a. Set the instrument controls as follows:

Control	Setting
CLOCK RATE	50 MHz
CLOCK RATE vernier	fully clockwise
FORMAT	RZ
WIDTH	100 ns
WIDTH vernier	fully counterclockwise
BIT 16	RZ
RECYCLE COMMAND	SYNC
UPPER LEVEL	+5 V
LOWER LEVEL	0 V

b. Connect the external pulse source to the RECYCLE INPUT. Set the source for a repetition rate of 1 MHz and an amplitude of +2 V.

c. Monitor the TRUE OUTPUT with the sampling oscilloscope. Trigger the oscilloscope from the BIT 1 SYNC OUTPUT.

d. Depress all DATA CONTENT pushbuttons except number 15. Adjust C173 so that Bit 16 is true for the same period of time that Bit 16 is false.

4.6 WIDTH/RZ CALIBRATION

a. Set the instrument controls as follows:

Control	Setting
CLOCK RATE	1 MHz
CLOCK RATE vernier	mid-range
FORMAT	PULSE
WIDTH	100 ns
WIDTH vernier	fully clockwise
UPPER LEVEL	+5 V
LOWER LEVEL	0 V

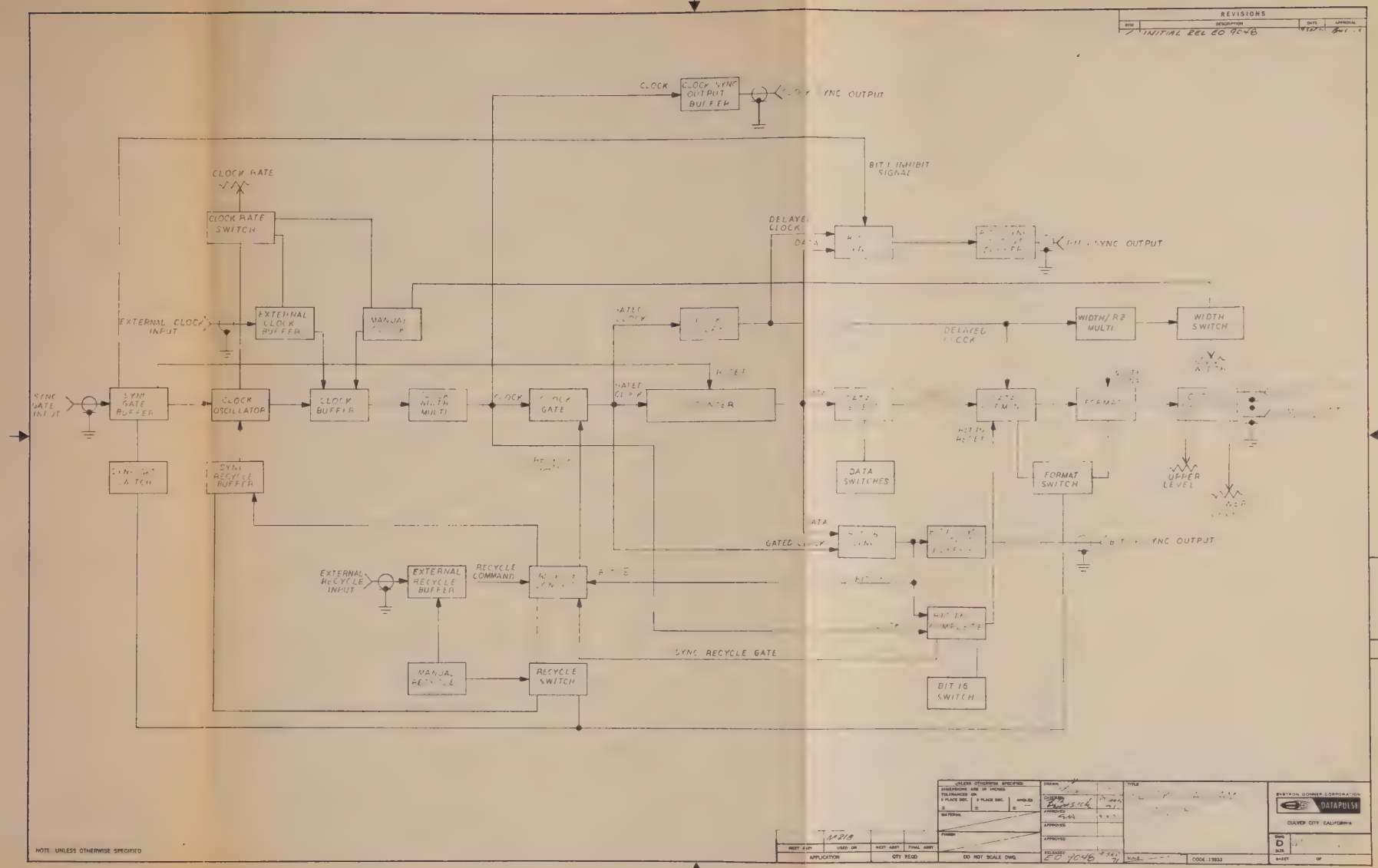
b. Monitor the TRUE OUTPUT with the sampling oscilloscope. Trigger the oscilloscope from the CLOCK SYNC OUTPUT. Terminate both outputs with the 50 ohm, 10X attenuators.

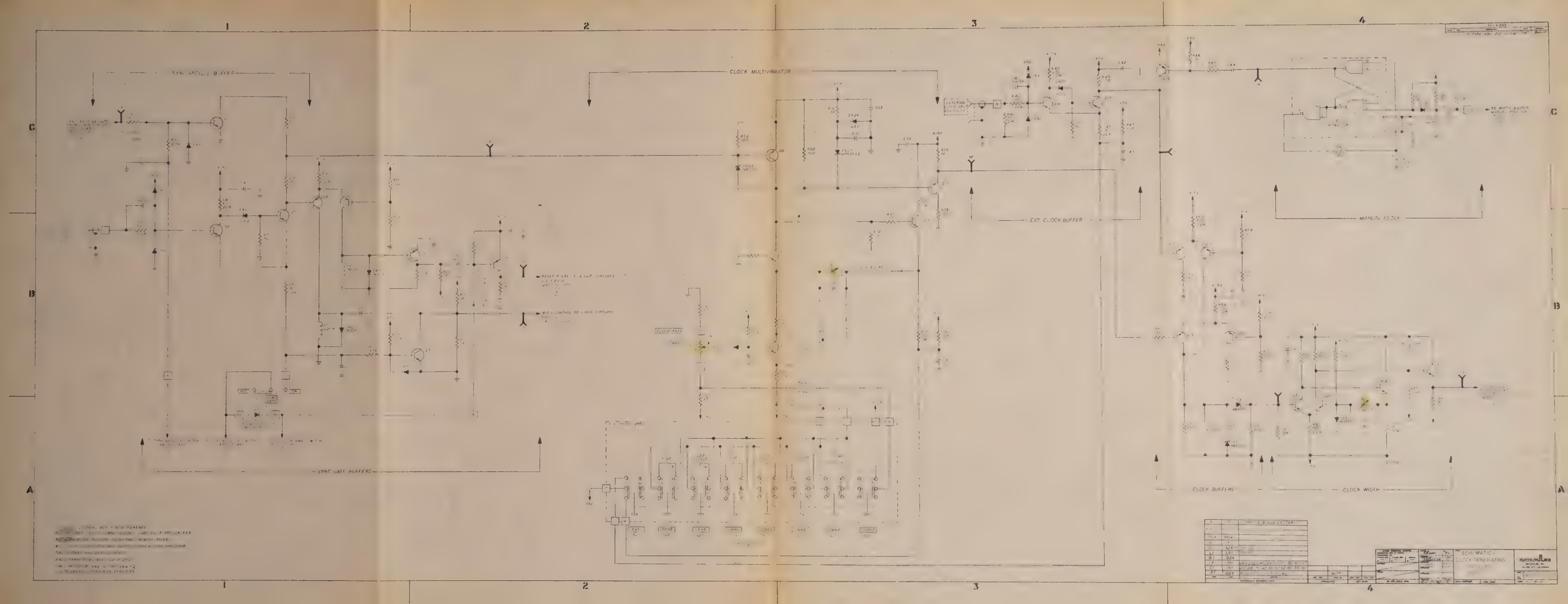
c. Adjust C218 for a pulse width of approximately 110 ns.

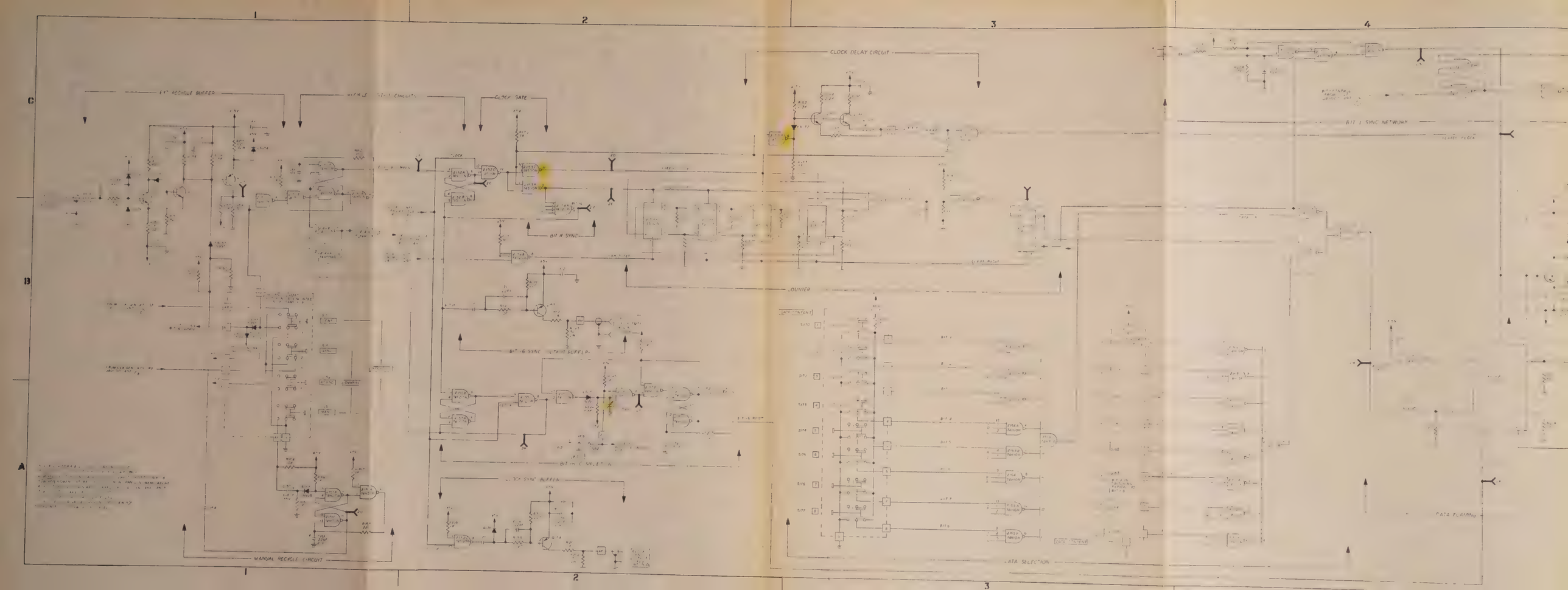
d. Set the pulse width vernier fully counterclockwise and verify a pulse width of approximately 10 ns or less.

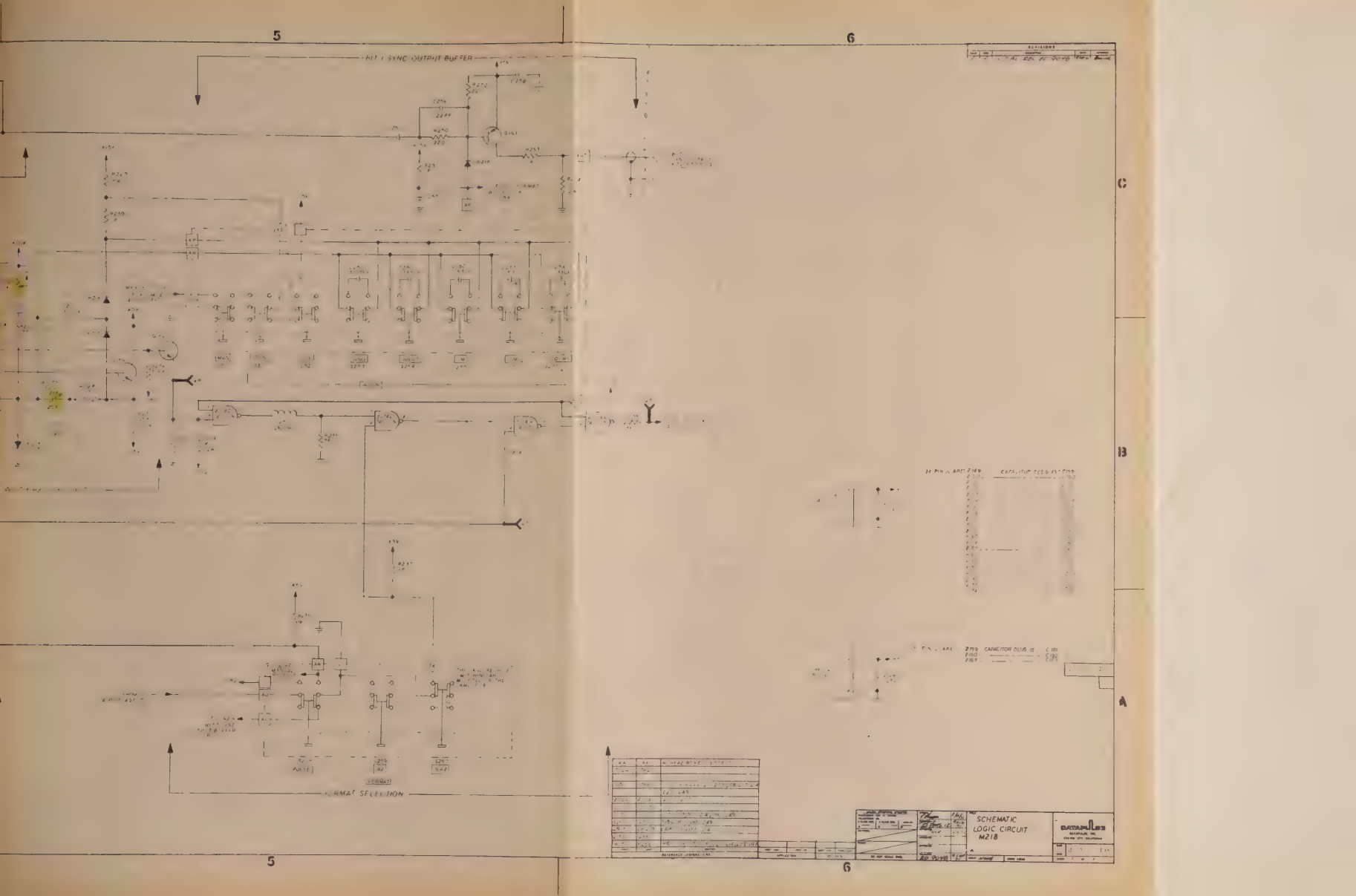
e. Check the remaining width ranges for overlap at the upper and lower limit. Use the real-time oscilloscope to check all but the 1μs and 100 ns ranges. Attenuate the OUTPUT and SYNC OUTPUT with the 50 ohm, 10X attenuator when using the sampling oscilloscope.

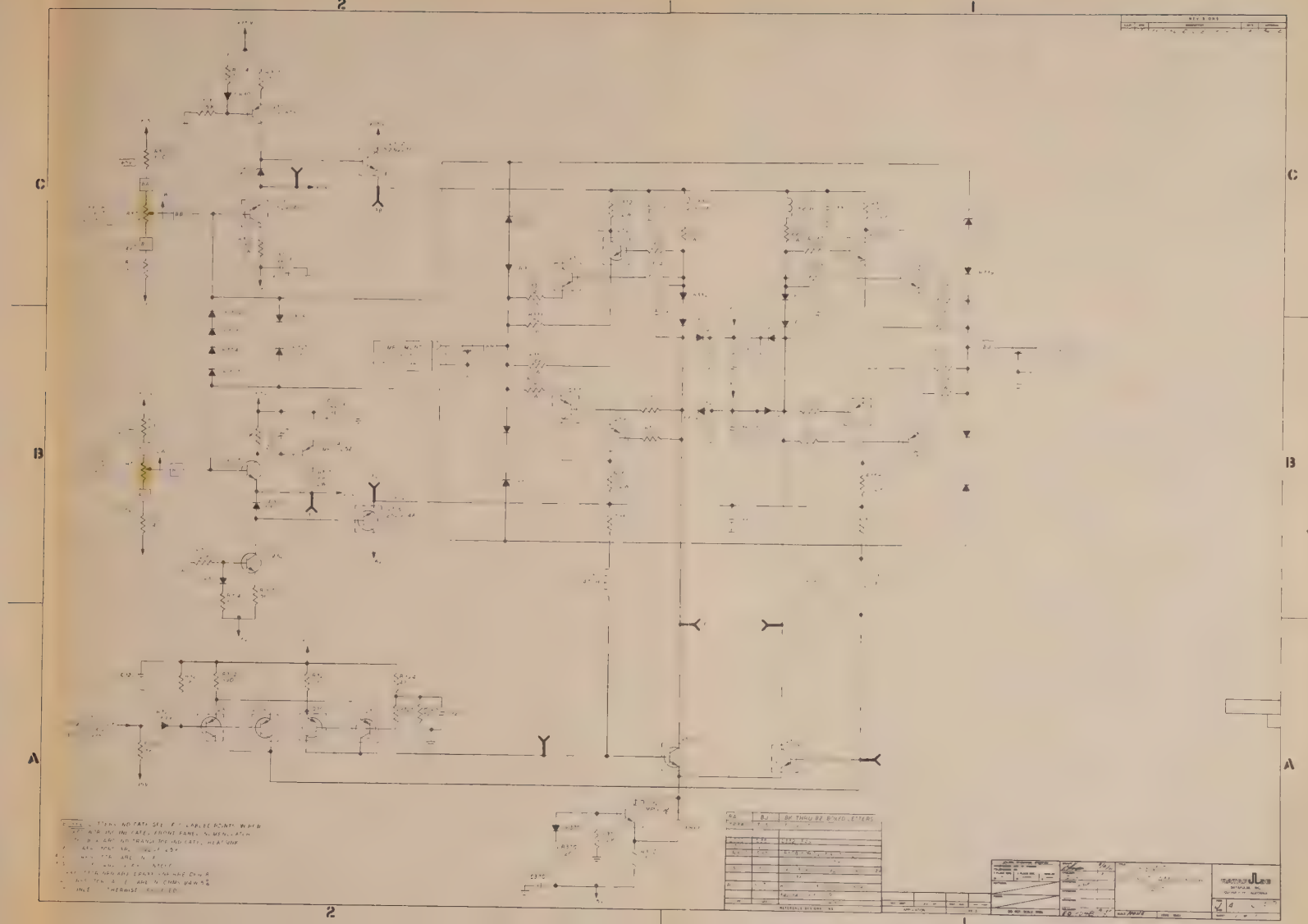
NOTE: If it is not possible to get overlap on all ranges, check the appropriate timing capacitor (C250 through C254).

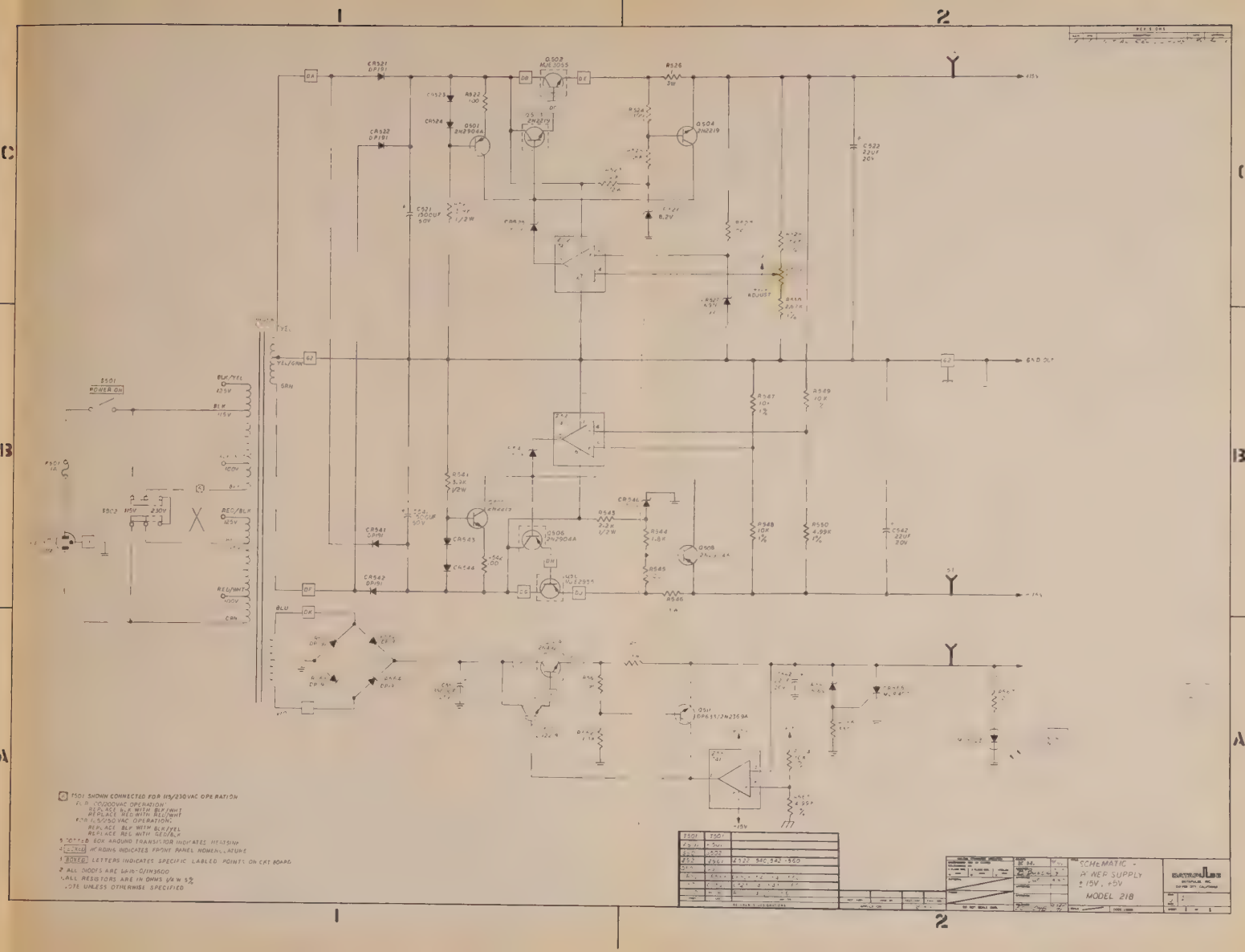

REVISIONS
INITIAL REL EO 9046
CLOCK
CLOCK SYNC OUTPUT BUFFER
CLOCK RATE
CLOCK RATE SWITCH
BIT I INHIBIT SIGNAL
DELAYED CLOCK
EXTERNAL CLOCK INPUT
EXTERNAL CLOCK BUFFER
MANUAL
WIDTH/RZ MULTI
WIDTH SWITCH
SYNC GATE INPUT
SYNC GATE BUFFER
CLOCK OSCILLATOR
CLOCK BUFFER
CLOCK GATE
DATA SWITCHES
FORMAT SWITCH
UPPER LEVEL
SYNC RECYCLE BUFFER
EXTERNAL RECYCLE INPUT
EXTERNAL RECYCLE BUFFER
RECYCLE COMMAND
SYNC RECYCLE GATE
MANUAL RECYCLE
RECYCLE SWITCH
BIT 15 SWITCH
NOTE: UNLESS OTHERWISE SPECIFIED
DATAPULSE
CULVER CITY CALIFORNIA
DO NOT SCALE DWG.
CODE 19853


SYNC WIDTH & BUFFER
CLOCK MULTIVIBRATOR
EXT CLOCK BUFFER
MANUAL CLOCK
TO WIDTH SWITCH
RESET PULSE TO LINE CIRCUITS
BIT CONTROL TO LOGIC CIRCUITS
SYNC GATE BUFFERS
CLOCK BUFFERS
CLOCK WIDTH
SCHEMATIC
CLOCK GENERATING


1
2
3
4
C
B
A
CLOCK DELAY CIRCUIT
GLOCK GATE
BIT 4 SYNC
BIT 6 SYNC
BIT 1 SYNC NETWORK
COUNTER
DATA SELECTION
DATA FILTERING
MANUAL RECYCLE CIRCUIT


5
6
C
B
A
HIT / SYNC OUTPUT BUFFER
FORMAT SELECTION
SCHEMATIC
LOGIC CIRCUIT
M218




SCHEMATIC -
POWER SUPPLY
±15V, +5V
MODEL 218
EATON/AIL
POWER ON
BLK/YEL
BLK
YEL/GRN
GRN
RED/WHT
RED/BLK
BLU
GND OUT
+15V
-15V
+5V
ADJUST
1. [1501] SHOWN CONNECTED FOR 115/230VAC OPERATION
FOR 100/200VAC OPERATION:
REPLACE BLK WITH BLK/WHT
REPLACE RED WITH RED/WHT
FOR 115/230VAC OPERATION:
REPLACE BLK WITH BLK/YEL
REPLACE RED WITH RED/BLK
2. DOTTED BOX AROUND TRANSISTOR INDICATES HEATSINK
3. (A-XX) INDICATES FRONT PANEL NOMENCLATURE
4. BOXED LETTERS INDICATES SPECIFIC LABELED POINTS ON CKT BOARD.
5. ALL DIODES ARE 1N16-G/1N3600
6. ALL RESISTORS ARE IN OHMS 1/4 W ±5%
UNLESS OTHERWISE SPECIFIED

E. O. NO.	EFFECTIVE DATE	DWG. NO.	CHANGE
3710	12-7-71	Manual	Change Pulse Width Specifications to read: "Continuously variable from 13 ns to 100 ms."
9119	12-9-71	40000-497	Add R39, 100 ohm, ¼ W, 5% in series with R18 and +5 V. Add C10, 22 μF, 20 V from junction of R18 and R39 to ground. Add C36, 0.022 μF from E—Q11 to ground. Change CR23 from HPA2833 to HPA2900. dd S91 at point P.
		40000-498	Move anode of CR155 from AE to AC. Connect cathode of CR155 and anode of CR156 to AE. Add R169, 220 ohm, ¼ W, 5% from Z152D pin 12 to ground. Change R194 from 6.8 k to 10 k. Change R184 from 2.2 k to 10 ohm. Change R226 from 2 k to 25 k. Move R227 up so that C217 goes directly to base of Q158. Add R238, 56 ohm, ¼ W, 5% between base of Q160 and C—Q158. Delete S250.
		40000-499	Add C312, 0.22 μF getween B—Q303 and E—Q303. Add R363, 100 ohm, ¼ W in parallel with L350. Change C371 from 68 pF to 0.022 μF.
		40000-500	Change R549 from 10 k to 15 k. Change DR to +5 V.
3715	12-15-71	40000-498	Move TP2U and C154 from junction of Z151D, pin 11 and Z151B, pin 4 to junction of Z151A, pin 3 and R168. Change C157 from 6.8 μF, 35 V, P/N11492-685 to 4.7 μF, 20 V, P/N11491-475.
		40000-497	Move TP1H and C44 from junction of Z1 pins 11 and 5 to junction of Z1 pin 3 and R91. Change C93 from 6.8 μF, 35 V, P/N11492-685 to 4.7 μF, 20 V, P/N11491-475 Change C82 from 15—60 pF, P/N11307-600 to 7—25 pF, P/N11305-250 and add 10 pF, P/N11077-100 as the value for C83 instead of 0.022 μF, 25 V, P/N11241-223. Remove R238, 56 ohm from between B—Q160 and C—Q158 and replace with jumper. Add R238, 56 ohm, P/N10010-560 between B—Q159 and C—Q157 and cut existing trace. Add 100 k, ¼ W, 5%, P/N10010-104 between junction of CR330 and CR331 to anode of CR351. Add 100 k, ¼ W, 5%, P/N10010-104 between junction of CR354 and CR355 to cathode of CR338.

E. O. NO.	EFFECTIVE DATE	DWG. NO.	CHANGE
3750	1-7-72	40000-497	Add Note 8: ⚡ Indicates hot carrier diode, HPA5082-2811. Delete MBD101 from CR22, CR61, CR62. Delete HPA2833 from CR23.
		40000-499	Add Note 9: ⚡ Indicates hot carrier diode HPA5082-2811. Delete HPA5833 from CR352, CR353 and change to note 9 symbol.
3786-	1-31-72	Manual	Change paragraph 4.5 step (a) as follows: Change FORMAT control setting to NRZ; Change paragraph 4.5 step (d) to read: Depress DATA CONTENT pushbuttons 14 and 16. Adjust C173 so that Bit 16 is true for the same period of time that Bit 14 is true.
3945	5-24-72	40000-497	Install 15 pF dip capacitor from circuit point J (main board) to ground, P/N11077-150, add asterisk (*). Install 0.022 μF, 25 V, P/N11241-223 capacitor from collector of Q12 to ground. Add note: Asterisk (*) may or may not be present.
3950	6-3-72	40000-500	For 230 volt operation, change the current value of the fuse to the next size over ¾ the current value at 115 volt operation.

SEMICONDUCTOR REPLACEMENTS
(Applicable to all Datapulse Models except the Model 102).

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The listed commercial equivalent diodes and transistors are suitable replacements for the corresponding Datapulse parts, either as direct substitues, or as selected for the special performance characteristics given.

DATAPULSE TYPE NO.	DATAPULSE PART NO.	COMMERCIAL EQUIVALENT
Diodes:		
DP15-0	22154-000	1N752A selected for $\Delta V < 0.2$ V between 7 mA and 110 mA.
DP15-1	22154-001	Same as DP15-0 but matched in pairs to within 0.1 V.
DP15-201	22154-201	1N936 selected for 9.4 V $\pm$0.1 V @25 mA.
DP16-0	22164-000	1N3600
DP16-1	22164-001	1N3604
DP16-2	22164-002	HPA1003
DP19-0	22194-000	1N2070/1N4005
DP19-1	22194-001	1N4002
DP19-6	22194-006	1N2071/1N4005
Transistors:		
DP43-0	22435-000	2N984
DP46-1	22465-001	Selected for h_{fe} = 100 min.
DP59-0	22595-000	2N1132
DP60-1	22605-001	2N2894 selected for V_{ceo} (sust) = 20 V min.
DP60-2	22605-002	2N3133
DP60-4	22605-004	2N3209
DP60-5	22605-005	FT1702
DP60-6	22605-006	2N3640
DP60-7	22605-007	2N2894 selected for V_{ceo} (sust) = 25 V.
DP63-2	22635-002	Replaced by DP63-3
DP63-3	22635-003	2N2369A (Fairchild)
DP63-4	22635-004	2N3646 or 2N2369A
DP63-6	22635-006	2N2270
DP63-7	22635-007	2N3261 selected for C_{OB} of 3.3 pF or less.
DP63-8	22635-008	May be replaced by 2N5109 selected for $h_{fe} \geq 20$ @I_c = 0.25 A & V_c = 2.5 V
DP63-9	22635-009	May be replaced by 2N5109 selected for $h_{fe} \geq 20$ @I_c = 0.25 A & V_c = 2.5 V
DP64-0	22645-000	May be replaced by 2N5109 selected for $h_{fe} \geq 20$ @I_c = 0.25 A & V_c = 2.5 V

WARRANTY

The Datapulse Division, Systron-Donner Corporation (hereinafter referred to as Datapulse) warrants each instrument of its manufacture to be free from defects in material and workmanship. Our obligation under this Warranty is limited to servicing or adjusting any instrument returned to our factory for that purpose, and to making good at our factory any part or parts thereof except tubes, transistors, fuses or batteries which shall, within one year after making delivery to the original purchaser, be returned to us with transportation charges prepaid, and which our examination shall disclose to our satisfaction to have been thus defective.

Instruments returned under this Warranty will not be accepted at the Datapulse plant without prior authorization by a Datapulse representative or by the service manager of Datapulse.

Datapulse reserves the right to make changes in design at any time without incurring any obligation to install same on units previously purchased.

This Warranty is expressly in lieu of all other obligations or liabilities on the part of Datapulse and Datapulse neither assumes nor authorizes any other person to assume for them any other liability in connection with the sales of Datapulse instruments.

MP MASTER
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